CSIR NEWS

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Testing and Evaluation of Engineering Materials and Products : Facilities at CMERI

Evaluation of engineering materials of construction and of finished products including components is basic to research in the field of mechanical engineering. Finished products of diverse origin, design and specifications have to be evaluated not only from the point of view of the raw materials that go into them but also their design characteristics, performance ratings, etc. Such detailed evaluation is essential to obtain data necessary for innovation and development of new products, and for improvement of existing ones. This not only involves large scale testing but also development of new instruments and equipments, techniques, etc. Facilities for such evaluation are not available within the engineering industry and the need for providing these facilities assumes an urgency particularly when endeavours are being made for import substitution and export promotion of a large variety of engineering goods. Replacement of imported products by indigenous ones requires rigorous evaluation of materials and performance of finished products.

Keeping these requirements in view the Central Mechanical Engineering Research Institute (CMERI), Durgapur started providing material and product evaluation facilities in some areas to the mechanical engineering industry; the facilities are being constantly augmented to cater to the growing needs of the industry. A unique feature of this service is that the responsibility of the institute does not end with the evaluation work; advice and assistance are given to industry to further improve the products. Industrial contacts have grown out of such assistance, and in many cases these contacts led industry to sponsor component and product development projects at the institute.

The computer (IBM 1620) installed at the institute is made available for training personnel from industry in computer programming. The computer facility is also being extended to other research institutions and industries.

The institute has a well-equipped workshop for fabricating prototypes and other jobs. The workshop facilities are provided to industry for specialized fabrication jobs.

Industry has been helped by the institute to set up its own laboratories for quality control and standardization of its products. The institute provides designs for special purpose test rigs. Instruments and equipment needed for evaluation, such as portable hardness tester, fatigue testing machine for helical compression springs, magnetic cracks dectecting machine, creep testing equipment, fluorescent dye penetrants for surface and sub-surface crack detection, etc., have been developed by the institute. Evaluation data provided by the institute have helped industries in organizing their sales promotion efficiently.

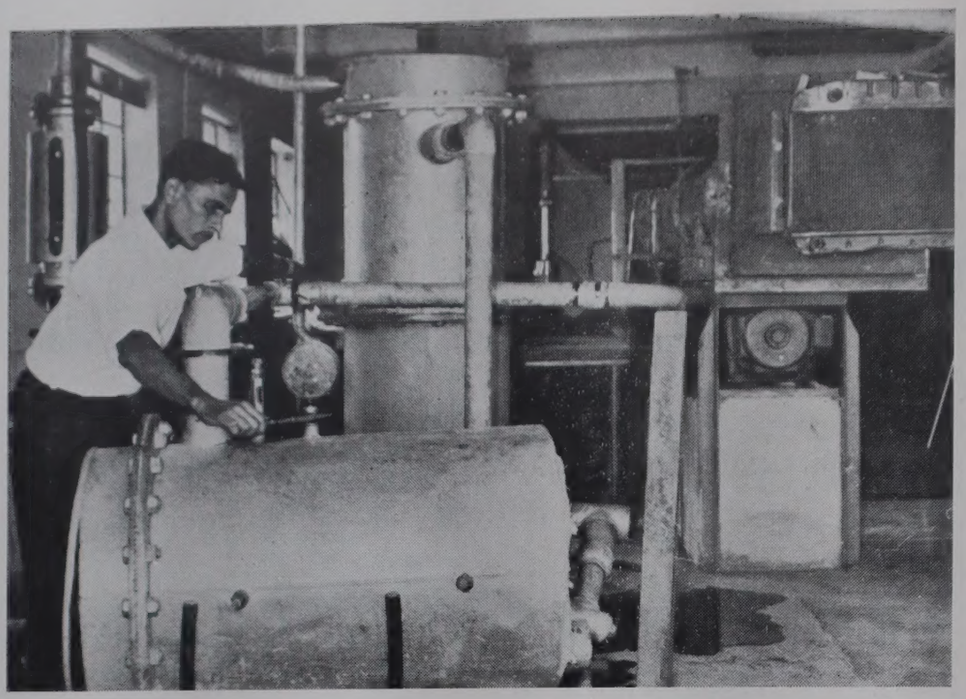
Facilities obtaining at CMERI for evaluating automobile ancillaries, internal combustion engines, refrigeration and air-conditioning machinery, engineering goods, etc. are briefly dealt with.

Precision Measurements and Calibration of Instruments and Tools

The metrology laboratory of the institute is one of the best equipped laboratories in India. Industries are taking advantage of the services offered by the laboratory in respect of measurement and recalibration of precision instruments and tools. Facilities are available for checking and calibration of micrometers, straight edge precision squares, surface plates, spirit levels, standard cylindrical plugs, standard cylindrical rings, parallel screw plug gauges, parallel screw ring gauges, length bars and accessories, slip gauges, angle gauges, dial gauges and test indicators, vernier calipers and height gauges, sine bars, clinometers, dividing heads, plain taper and pressure gauges. Facilities are also available for determing the surface texture of plane surfaces, departure from roundness of ball bearing races, etc. Personnel are trained in the operation of precision metrological instruments. Assistance is also given to the Indian Standards Institution in the framing of specifications for precision measuring instruments and gauges.

IC Engines and Automobile Ancillaries

The institute has developed facilities for the evaluation of IC engines and automotive ancillaries with a view to assisting the development of indigenous components for the IC engine and automobile industry. Apart from the ever-increasing demand for automobiles, the users are becoming more quality and performance conscious. Evaluation of components like automobile radial oil seals, fan belts, radiators, shock absorbers, clutch material, brake material and fabric friction liners is carried out by the institute. Advice is tendered for improving the product on the basis of evaluation results. Development of evaluation facilities for the testing of vehicle chassis, suspension system and various other components is in progress. It is proposed to extend these to cover the entire range of components and sub-assemblies. An automotive vehicle is being equipped with necessary instrumentation for the study of vehicle dynamics. Instrumentation for braking performance test is being done. The data obtained would be valuable for developments in automobile design for improving the riding qualities of vehicles.



Set-up for testing radiators

Evaluation of filters used in automobiles is also done. As substitutes for imported filters are being developed by industries, there is great need for evaluating the performance of the indigenous product in comparison to that of the imported product. Facilities exist for the evaluation of fuel oil, lubricating oil and air filters for automotives and railway diesel locomotives. Arrangements have also been made for testing filters for air-conditioning and general ventilation purposes. Set-ups for evaluation of filtering media have been installed. The institute has also developed standard contaminants for testing filters which are supplied on request.

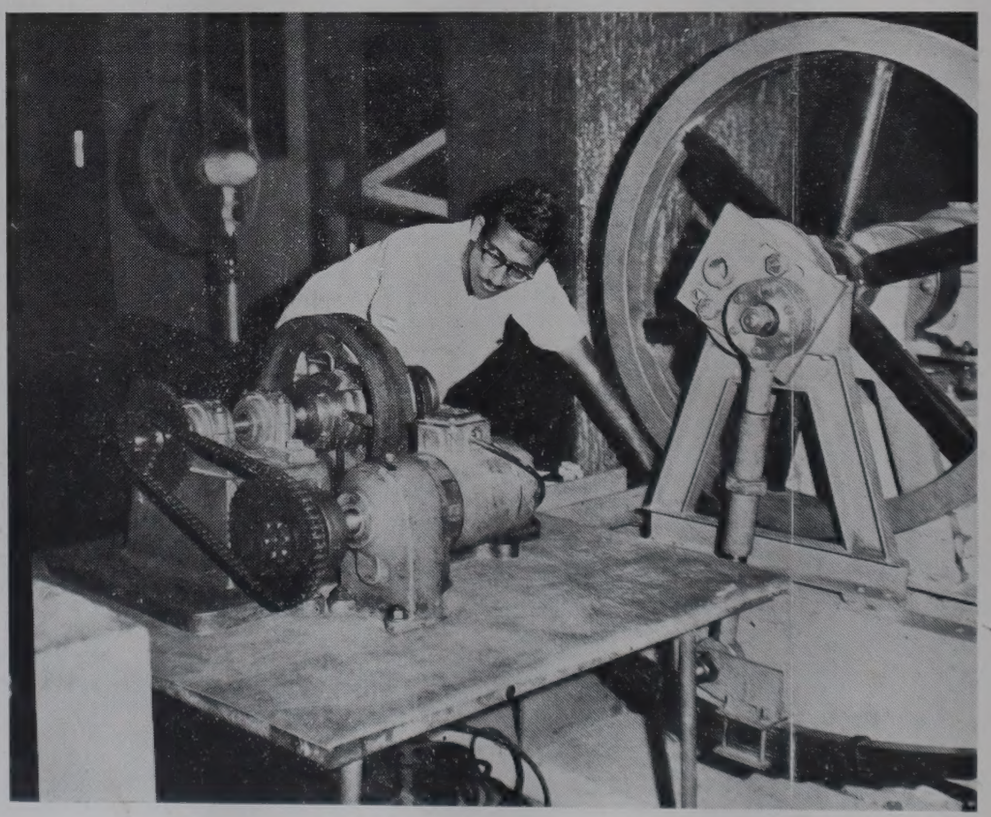
The institute designed and fabricated many evaluation equipment and assemblies needed for the development of various types of internal combustion engines for various uses. Facilities exist for evaluating IC engines up to 600 hp as per IS: 1601. Measures are also being taken for testing couplings and reduction gears.

Materials Testing and Evaluation

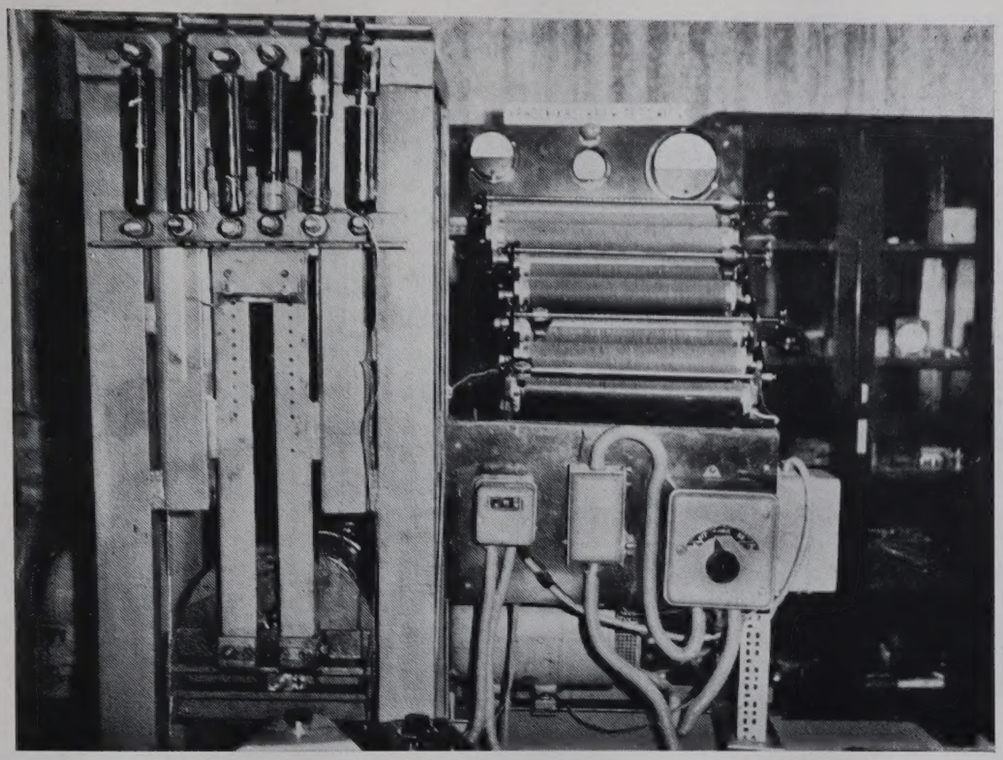
Self-reliance in industry mostly depends on the development of suitable metals, alloys and composite materials needed by the engineering industry for the manufacture of various products. Efforts are being made in the country for the development of substitute materials and search is afoot for utilizing indigenous materials. Substitution of indigenous materials for imported materials involves sustained and rigorous evaluation as to their suitability. With a view to helping the industries, the institute provides facilities for material selection and evaluation, and also advises on further development based on such evaluation.

Facilities have been established for mechanical and non-destructive evaluation and metallurgical, physical and chemical analyses of materials. In the field of destructive testing, studies on sintered bearings are under way at the instance of a firm. Design and development of a 10-tonne universal testing machine and indentation hardness test blocks are some of the projects in hand. In the field of metallurgy, replacement of copper base self-lubricating bearings by aluminium alloy bearings is being tried. For improved wear and other mechanical properties studies are are being made on the use of tin as a pearlite stabilizer in graphite cast iron. Studies on the deterioration of crank case lubricating oils for automobile engines under Indian road conditions have been completed. Spectrographic analysis of ferrous as well as non-ferrous metals and alloys, ores and minerals, and ceramic materials is undertaken. Fuels and lubricants can be evaluated for various properties.

Mechanical Testing—Mechanical testing covers a wide range of tests such as tensile, transverse, torsion,



Brake lining test rig



Set-up for evaluation of shock absorbers

Refrigeration and Air-conditioning Equipment and Machinery

Facilities have been created for the evaluation of domestic refrigerators, water coolers, small hp compressors and refrigeration condensing units. The facilities are being constantly expanded to cater to the growing demands. Advice is given to refrigeration and air-conditioning industry for improving its equipment.

Welding Equipment

In modern mechanical engineering, fabriation techniques play a key role. Welded structures, pressure vessels, jet aircrafts and heavy equipment need special welding. The increasing use of welding techniques has necessitated evaluation of welding equipment. Facilities exist for undertaking the evaluation of electrodes, and for carrying out flux-electrode wire combination test for submerged arc automatic welding process.

bend, fatigue, impact, shear, deep drawing, compression and hardness tests. Hydraulic stretch test for gas cylinders is also undertaken. These facilities are being extended to cover wider range of tests, i.e. creep tests, testing of sintered bearings, abrasion tests, static dynamic evaluation of conveyor idlers, low temperature impact properties of steels, etc. Calibration of testing machines is also undertaken on request.

Non-destructive Testing—With a spurt in the production of welded engineering materials, the need for non-destructive quality control is on the increase and demand for such facilities from industry is growing. Facilities exist at the institute for radiographic and ultrasonic evaluation, magnetic particle evaluation and penetrant evaluation of castings, forgings, welds, plates, etc. Ultrasonic thickness survey is also undertaken for chemical and fertilizer plants. Specialist advice on interpretation of radiographs is also given.

Investigations are undertaken to solve material failure problems. Facilities exist for macro- and microstructure, micro-hardness, sulphur print, coating thickness, particle size determination and distribution. Facilities also exist for heat treatment of small components.

Sintered bearing test rig

Heat Transfer and Fluid Mechanics

A low velocity wind tunnel, designed and fabricated by the institute, is being used for the performance evaluation of air-cooled heat exhangers and automotive radiators. Calibration of pitot tubes, hot wire anemometer probes and temperature sensing elements can be undertaken. Measurement of thermal conductivity of materials as well as thermal properties of insulated materials is undertaken.

Performance tests for pumps (up to 60 hp), performance testing of fans (up to 70 hp) and of calibration of flow meters are undertaken. Evaluation facilities for rotodynamic pumps have been established. A number of industrial establishments have been assisted in solving their fluid machinery problems.

Structures

A structural test bed has been constructed and sophisticated equipment for subjecting full scale structural elements to static and dynamic loads has been installed. The facility may be extended to industry for testing its structural elements. Strain gauge equipment is taken to site on request from industry for carrying out strain measurements. The institute also undertakes investigations on vibration problems in structures, heavy machinery and machine tools. Instrumentation required for vibration measurements is also being developed.

Balancing of rotors poses a great problem to fan and motor industries. A dynamic balancing machine has been developed for this purpose. Portable balancing equipment is also available with the institute for the balancing of heavy machinery.

Revenues

Industrial units have availed of the developmental evaluation facilities of the institute. These services have led to the indigenous development of many products, increase in sales as well as export promotion. The direct earnings of the institute from the testing of industrial products have been increasing: 1965-66—Rs 36 143; 1966-67—Rs 1 34 856; and 1967-68—Rs 1 61 404. An estimate of the savings due to developmental efforts of the institute would place the foreign exchange saving during the past 6 years at over Rs 20 crores.

Internal Combustion Engines: Fuels and Lubricants Requirements

Seminar at IIP

A seminar on 'Internal combustion engines—their fuel and lubricant requirements' was held at the Indian Institute of Petroleum (IIP), Dehra Dun during 7-8 Nov. 1969. Seventeen papers dealing with fuel, ignition, detonation, lubricants, lubrication devices for measurement techniques and improvements pertaining to the performance of internal combustion engines were presented and discussed in three technical sessions: (1) Fuels, and combustion, (2) Lubricants and lubrication, and (3) Measurement techniques in internal combustion engines. Some 50 delegates participated in the seminar.

Fuels and Combustion

In view of the expansion of refining capacity, large quantities of liquefied petroleum gases are likely to be available. At present liquefied petroleum gas (LPG) is used only as a domestic fuel. The use of LPG in a Kirloskar AVI diesel engine converted into a spark ignition (SI) engine was described by R. S. Dandekar, V. P. Alexeev and B. S. Chittawadgi (IIT, Bombay). It was found that LPG could be used successfully as a fuel in SI engines with improvement in maximum mean effective pressure and coefficient of heat utilization.

Improvement in fuel economy in the operation of automotive spark ignition engines can be achieved by proper selection of compression ratio, spark advance and then matching it with motor gasoline of suitable antiknock quality. Over the last five years octane numer (ON) requirements of cars of all Indian manufacturers were assessed at IIP. Based on this work, B. P. Pundir, B. A. Chitnavis, R. A. Rao and P. K. Goel of the institute showed that with the introduction of 83 ON gasoline and without any modification in the engine, a net benefit of Rs 18 million could be had by car users. However, the consumers' benefit would be of the order of Rs 50 million, if at least 50% of the cars could be modified for increased compression ratio (8:1) on optimum spark advance with 83 ON gasoline.

Lubricants and Lubrication

In his paper 'Automotive motor oils—advances made over the last 40 years and future perspectives', A. Schilling, an authority in lubrication technology from the Institut Francaise du Petrole, Paris, laid emphasis on the development of new additives and new base stocks for producing finished oils.

Reviewing the history and development in Europe of high performance diesel oils, a new class of heavy duty lubricants, Ian Glover of Lubrizol Corp. concluded that future improvements depend on advanced additive technology and better refining to provide better base stocks.

Different periodicities are laid at present for changing crankcase oils, which are much lower than those recommended by various oil companies. The extent of deterioration depends upon the type of terrain and actual conditions of operation. To assess the actual deterioration of crankcase oil, which would result in overall economy and reduction of troubles, a portable kit has been developed by A. G. Menon, R. D. Srivastava, N. R. Iyer and S. L. Kalra of the Defence Research Laboratory (Materials), Kanpur. The kit is capable of assessing the deterioration of engine oils during use in respect of solid contaminants, fuel dilution, water, mineral acidity and detergent/dispersant additives.

'Increase the efficiency of IC engines by improving lubrication' is the title of a 'paper presented by K. S. Salariya of the Punjab Agricultural University, Ludhiana. On the basis of experiments carried out by him in Germany, he concludes that using an additive like colloidal graphite or colloidal MoS_2 at 3% level in motor oil, friction can be reduced by about 35%, and engine efficiency can be increased by 9%.

Measurement Techniques in IC Engine

Sophisticated instrumentation is needed for studying the highly complex phenomenon such as instantaneous temperature and pressure of

the working fluid, instantaneous heat transfer rates, cylinder wall temperatures, turbulence and air motion inside the cylinder of an IC engine. The paper 'Some instrumentation techniques for engine research' by C. P. Gupta (University of Roorkee, Roorkee) reviewed some of the instrumentation techniques now available for carrying out research on IC engines. Emphasis was laid on the development of suitable instrumentation for measurement of air motion and turbulence.

An electronic analyzer for diesel engines, developed for rapid diagnosis of the injection system, was described by R. Germann, M. Schwertfuehrer, C. R. Forsman and W. R. Schwindeman in their paper. The device uses calibrated quartz pressure transducers to measure the instantaneous pressure in each injection line. Pressure from the first cylinder is used to produce synchronization with crank shaft rotation and the trace for each injection line is then displayed on a conventional cathode ray engine analyser. The instrument can also measure precisely nozzle static pressure and timing advance at various speeds.

A radiometric technique developed for measuring lubricating oil consumption in an IC engine was described by K. Sachdev and P. C. Nautiyal of IIP. B. S. Chittawadgi and R. K. Kaura (IIP, Bombay) described the design of a portable smoke meter for the measurement of smoke density of diesel exhaust gases.

PROGRESS REPORTS

NPL Annual Report—1967-68

In pursuance of its statutory obligation the National Physical Laboratory (NPL), New Delhi intensified its efforts to improve the accuracy of existing standards and establish new ones. The annual report of the laboratory for 1967-68, published recently, reveals that an important development in the field of standards research and maintenance was the fabrication of 1-ohm standard resistance. The resistance coils, made of manganin, are annealed and enclosed in a suitably designed cylindrical vessel containing moisture- and air-free insulating oil. A 10-ohm resistance box was also built using twelve 12 standard resistances.

A notable achievement in the field of materials research was the development of semiconductor grade silicon used in transistors and rectifiers. The method consists in crack ing silicon tetra-iodide obtained by the reaction of indigenous ferro-silicon with iodine; about 100 g of polycrystalline transistor grade silicon were produced. Silicon has assumed a pivotal position in the electronics industry as a variety of solid state devices are fabricated using this element which is replacing germanium. The present estimate of the country's requirement of semiconductor grade silicon is about 2000 kg/annum and at the current price of Rs 10 000/kg, the estimated foreign exchange savings when the production of the material is established in the country would be about Rs 2 crores/annum.

Complete technical know-how for preparing metal-dielectric-metal thin film interference filters in the visible region of spectrum was developed. The filters can withstand a temperature of 70°C and humidity up to 80%. Techniques were also developed for sticking the filters with Canada balsam to a protective blank glass plate. A number of filters were fabricated and supplied to several university departments. Techniques were also developed for preparing more sophisticated narrow band-pass all-dielectric multi-layer filters.

Design and development of microwave test bench for X-band (8·2-12·4 kMc/s), comprising 27 different components, was another noteworthy achievement of the laboratory during the period under review. Twenty complete sets of test benches were fabricated and supplied to various universities. Used in microwave engineering research, each test bench produced at the laboratory costs only Rs 8000 as against Rs 25 000 for the imported set.

A photoelastic polariscope for determining stresses in loaded structures and machine parts was fabricated. The instrument can be adapted for both 2- and 3-dimensional photoelastic studies.

Process details for making short-cum-medium wave ferrite rods, covering frequencies in the medium and shortwave bands, were worked out. Antenna rods made by the process developed were found superior to the imported ones. A breakthrough was achieved in the technology of fabrication of complicated small sized cup cores using calcined ferrite powder as a filler with a thermoplastic resin and moulding them to shape using the conventional plastic moulding technology. The characteristics of the products were found to be similar to those of ferrite components made by high pressure pressing and firing.

Fundamental studies carried out by the laboratory were concerned with the electrical and magnetic properties of solids; thermal, magnetic and transport properties of metals and alloys at low temperatures; electrical and thermal conductivities of dilute magnetic alloys and ferrites at low temperatures; high temperature properties of metals; X-ray studies of solid solutions and phase transformations in semiconductor materials; and radio propagation. A Mossbauer study of $SrTiO_3$: ^{57}Fe system was made along with EPR and magnetic susceptibility studies to resolve the discrepancy between EPR and Mossbauer studies. The studies have shown conclusively that iron enters the lattice substitutionally at Ti^{4+} site in its high spin ferric state and is usully associated with a charge compensating oxygen vacancy. On firing these samples in hydrogen, the quadrupole split spectrum of Fe^{3+} associated with an oxygen vacancy transforms into a Zeeman split spectrum with hf field and isomer shift characteristic of iron metal indicating the formation of colloidal iron. The colloids exhibit superparamagnetism.

Of the analytical methods developed by the laboratory, mention may be made of a modified Gutzeit method for detecting arsenic and a polarographic method for detecting thallium in cadmium oxide (electroplating grade). The latter is of

particular significance to small works laboratories which cannot resort to spectrographic methods. A thin-layer chromatographic method for detecting argemone oil (as low as 0·1%) in vegetable oils like mustard oil would be useful in detecting adulteration of vegetable oils with argemone oil which is injurious to health.

Developmental testing of instruments produced by industry, one of the major objectives of the laboratory, was continued. The laboratory is equipped for testing radio receivers, TV receivers, cables, motors, fans, refrigerators, proving rings, temperature measuring devices, lamps and lamp fittings, microphones, etc. Facilities also exist for chemical, spectrochemical, X-ray fluorescence, and X-ray diffractometric and EPR analyses to test the purity and perfection of materials. Over 2000 test certificates were issued and the income from testing and calibration amounted to over Rs 1·02 lakhs. Four patents relating to the manufacture of soft ferrites, machinable ceramics, solar heating device and broadband ferrite resonance isolators for microwave frequencies were filed and accepted.

The report reveals that till the end of the period 1967-68, 23 processes developed by NPL had been released to industry, and the total value of products produced by industry utilizing the NPL processes amounted to Rs 2.48 crores; the value of products produced during 1967-68 was about Rs 40 lakhs.

Anticorrosive Paints

Corrosion inhibiting pigments like red lead, zinc tetra-oxychromate, calcium plumbate, zinc chromate, etc. are imported. Red lead is now being manufactured in the country from imported lead metal (about 5000 tons per annum). There is hence a great need for developing corrosion inhibiting pigments from indigenous raw materials. Studies for developing such pigments and evaluation of the primers made from them were made during 1965-68 by Shri G. W. Kapse, Scientist, Central Building Research Institute, (CBRI), Roorkee.

The two widely used pigments, viz. titanium dioxide and iron oxide, used by the paint industry are indigenously available. In the normally used state these are inert and cannot bring about chemical inhibition of the corrosion processes. According to one explanation corrosion basically involves an exchange of electrons, and these two inert pigments could be made to possess corrosion inhibiting properties by suitable modification of their electrical properties.

These two pigments were modified by heating them with certain additives (part process covered by Indian Pat. No. 110835 and 110854). Priming paints in linseed and alkyd media were made to test their corrosion inhibiting properties using red lead in linseed oil as reference control corrosion inhibiting primer. Tests carried out in the laboratory as well as the analysis of the data obtained from outdoor exposure (at Bombay, Calcutta, Kanpur, Jodhpur and Roorkee) indicated satisfactory corrosion inhibiting properties. It has been found that the manganese dioxide modified iron oxide pigment in alkyd medium could be used as an anticorrosive primer in place of the red lead primer. The modified iron oxide pigment is not only cheaper (Rs 2/kg) than red lead (Rs 5.50/kg) but possesses lower bulk density than red lead and is therefore more advantageous in paint formulation.

The findings could open up avenues for the development of new corrosion inhibiting pigments not only for ferrous but also for non-ferrous metals. Based on the research, Shri Kapse was awarded the Ph.D. degree by the Agra University in 1969 for his thesis 'Paints as anticorrosive agents: development of corrosion inhibiting pigments from iron and titanium oxides and paints therefrom'. The work is continuing as it forms part of the regular research programme at CBRI.

Strengthening of thin Cement Concrete Pavements

There are some 3000 miles of concrete roads in the country which have been rendered structurally inadequate with the increase in frequency and magnitude of wheel loads during the past two decades. Highway engineers in India are faced with the problem of finding techniques for strengthening the thin pavements effectively and economically. The problem has been receiving the attention of the Central Road

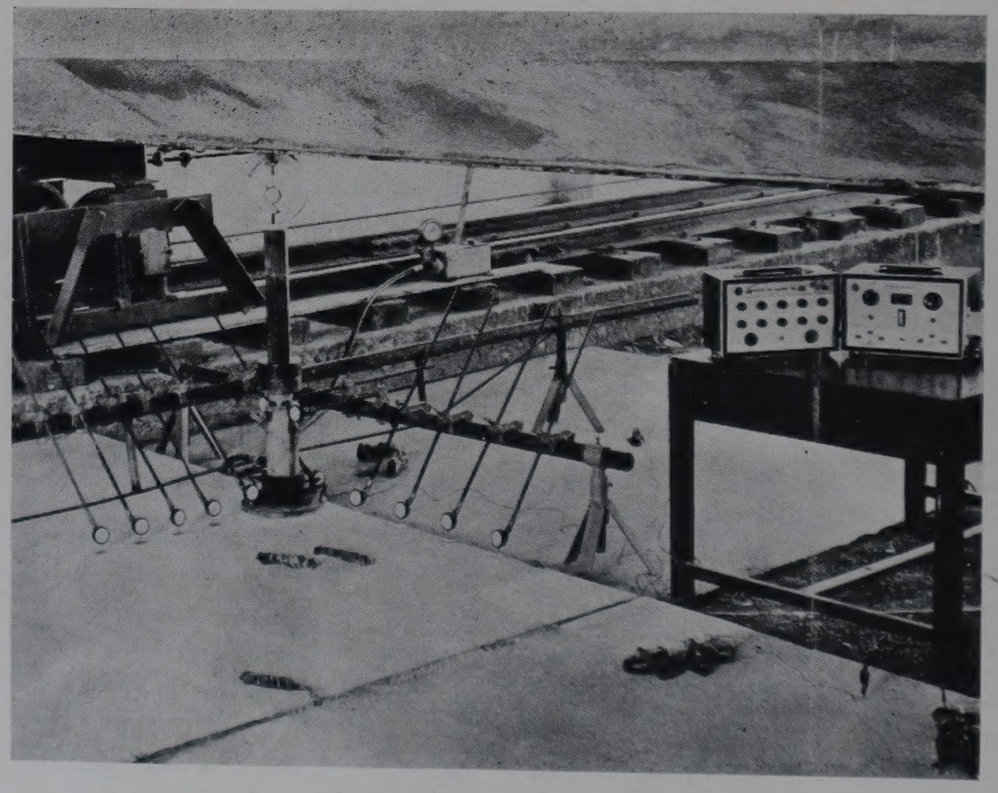


Fig. 1—A general view of experimental set-up under heavy test bed

Research Institute (CRRI), New Delhi. Research undertaken at CRRI covered the following two aspects: (i) effect of different thicknesses of granular and bituminous overlays on the deflections and strains of the thin cement concrete pavement; and (ii) assessment of the interfacial shear strength required for a bonded cement concrete overlay and the development of construction techniques so that requisite bond strength was obtained even under adverse weather conditions.

As part of the investigations of the problem, experimental sections were laid in the institute's premises. The sections to be subjected to load testing were prepared on the heavy test bed and instrumented for picking up maximum strains on the underface of the intermediate layer of concrete. A general view of this set-up is shown in Fig. 1.

The degree of load dispersion through the flexible overlay in interior loading condition was theoretically determined by treating the pavement structure (with flexible overlay) as three-layered elastic system, and by treating the overload pavement as two-layer system with the lower layer of concrete pavement acting as a rigid base. Load dispersion was assessed from direct measurement of strains in concrete for the interior, edge and corner loading conditions. A special system was evolved for measuring extreme fiber strains at the concrete underface. The effect of granular and bituminous overlays on the maximum temperature differentials in the concrete slab was also assessed.

The theoretical and experimental studies showed how the lower layer concrete pavement even with a thin slab acts as a relatively rigid base inhibiting the ability of the flexible overlay to disperse load. Based on this work, estimates can be made of the extent of life that can be derived from thin concrete pavement with different flexible overlays before the former would be fatigued.

Bonded concrete overlays provide an economical solution for strengthening thin concrete pavements as long as the interfacial bond can be developed effectively at a reasonable cost. The use of the bonded overlays is particularly relevant to India where material costs are relatively high compared to labour costs. It had been the experience all over the world that, with the most prevalent technique of etching with dilute hydrochloric acid and priming with cement mortar, adequate bond did not develop in the peripheral areas of panels in adverse weather conditions.

The problem was studied from two angles: analysis of the interfacial bond strength required, and study of the extent of bond strength developed in various typical parts under certain typical conditions (Fig. 2). It was found that bond strength required to be developed for the thin pavements is of the order of 250-300 psi, i.e. higher than that considered adequate in USA and other countries. Also, it was found that environmental factors prevailing when the overlay is young had considerable influence on the bond strength developed. An inexpensive technique has been developed for controlling the related environmental factors so that the requisite bond is obtained even under unfavourable conditions.

Shri M. P. Dhir of the institute, who carried out the research investigation under the guidance of Prof. S. R. Mehra (former Director, CRRI), was awarded the Ph.D. degree (1969) by the Panjab University, Chandigarh for his thesis entitled: 'Investigation of some of the design aspects related to the strengthening of cement concrete pavements with flexible and rigid overlays'.

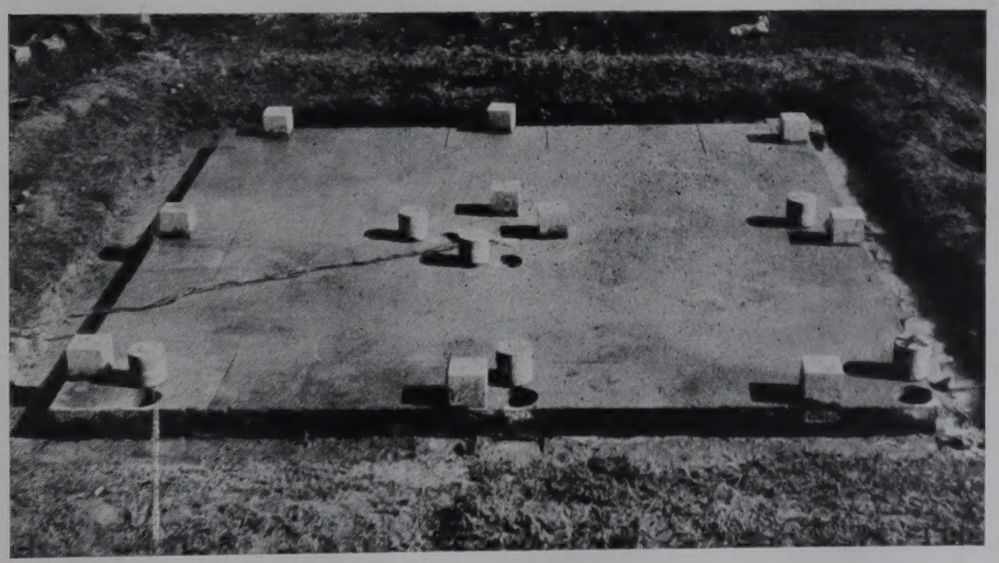


Fig. 2—Typical experimental panel for studying bond strength developed in different slab areas

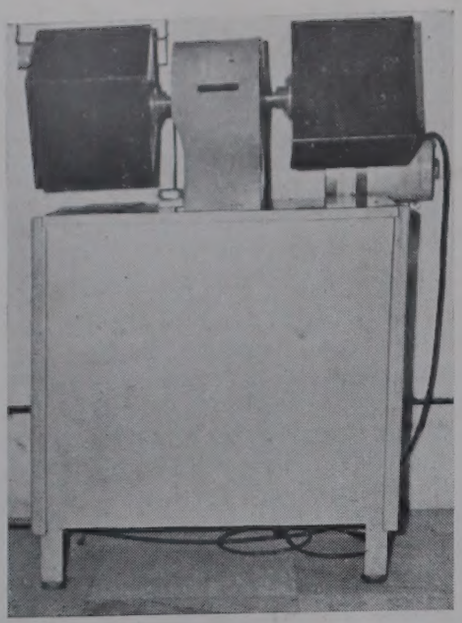
Pilling Tester

Sasmira's New Instrument

In its programme of developing testing instruments required by the textile industry for quality control purposes the Silk & Art Silk Mills' Research Association (Sasmira), Bombay has designed and fabricated a pilling tester. Pilling is caused by the entangled fibres on the fabric surface and this fault gives the garments an unsightly appearance. The pilling tester reproduces the pilling effect under normal wear conditions and is used for rapidly assessing the pill forming tendency of the woven or knitted fabrics with soft spun yarns. The pills produced are similar to those obtained by light rubbing action during normal wear. The performance of the instrument is comparable to that of the imported device.

A random tumbler tester, the instrument consists of two cubical wooden boxes, each lined with thick cork lining. An electric driving unit rotates each box at a constant speed of 60 rpm. An automatic switch can be fitted for stopping the machine after a predetermined interval. A specimen mounting jig along with rubber tubes is supplied. The jig consists of a base plate which is fixed to the wall carrying two rods.

The fabric for testing is conditioned for at least 4 hr at 25-29°C and 63-67% relative humidity. A specimen, 5 in. × 5 in., is cut from the fabric folded with the face side inward and then sewn half inch from the touching edges. The tubular



Pilling tester designed and fabricated by Sasmira, Bombay

specimen thus prepared after turning inside out gets a firm fit when placed round the rubber tube so that the outer surface consists of the face of the fabric to be tested. The fabric specimen covers the rubber tube with an even tension. Four specimens, prepared and mounted on rubber tubes, are then placed in two boxes of the tester. The machine is then set in motion. A standard testing time of 5 hr (18 000 revolutions) is suitable for routine testing. After tumbling as per the pre-determined rotations, the specimens can be assessed visually by comparison with the three recommended pilling standards.

In view of the popularity of blended fibre fabrics in the market and the future trends in blending technology, the pilling tester would be a valuable asset to the industry. The pilling tester is being used at Sasmira's testing laboratory with satisfactory results.

PATENTS

FILED

125354: A plate type plant to separate water and other solvents from solution, A. S. Kane, D. J. Mehta & M. V. Chandorikar—CSMCRI, Bhavnagar.

125355: New battery system incorporating tin anode, P. B. Mathur & N. Venkatakrishnan—CECRI, Karaikudi.

125356: A tubular type plant to separate water and other solvents from solution, A. S. Kane, D. J. Mehta & M. V. Chandorikar—CSMCRI, Bhavnagar.

125357: Cheap ardent domestic water filter, H. Bora, A. C. Khazanchi & M. S. Iyengar—RRL, Jorhat.

125374: Fluidic water sprayer, S. Ramachandra & S. L. Raj—MERDO, Madras.

125406: Magnesium organic depolarizer batteries, P. B. Mathur, N. Muniandi & R. Balasubramanian—CECRI, Karaikudi.

125410: Beneficiation of gypsum mineral and preparation of surgical grade plaster of Paris, S. P. Krishnaswami & S. K. Mehta—RRL, Jammu.

125605: A method of making anode block for magnetrons and a jig therefor, J. Singh & J. L. Bahri—CECRI, Pilani.

125684: Improvements in or relating to the production of matrix board (stereo flong), N. C. Nandi, C. N. Saikia, B. P. Chaliha, S. B. Lodh & M. S. Iyengar—RRL, Jorhat.

Patents Accepted

Indian Pat. No. 111492

New asbestos sprayer

S. S. Wadhwa & A. K. Chatterji
CBRI, Roorkee

Sprayed asbestos finds use in thermal insulation, sound absorption, prevention of sweating of walls and also as fire extinguisher. Imported chrysotile fibres are used by the sprayed asbestos industry in India. Attempts made to spray indigenous amphibole asbestos with the sprayers meant for spraying chrysotile fibres were unsuccessful; hence the need for a new asbestos sprayer, which has been designed and fabricated. It can spray both the indigenous and chrysotile varieties of asbestos. The cost of spraying an inch thick layer of asbestos per 100 ft^2 with the new asbestos sprayer developed is about Rs 4. The sprayer can spray an inch thick asbestos layer on an area of 50 ft^2 in an hour.

Indian Pat. No. 112617

Unit frame scaffolding

B. C. Srivastava & S. A. Siddiqui
CBRI, Roorkee

Timber scaffoldings, presently used for construction, maintenance and repairs of buildings, are time-consuming in erection and dismantling, and cannot be reused indefinitely. Unit frame scaffolding on the contrary has several advantages such as rigidity and stability, larger re-use and quickness and ease in erection and dismantling and transportation from site to site. The heights of the unit frame scaffolding can be varied from half a metre or one metre depending upon the requirement with a novel 'double decking' feature at the working level, which saves on labour and increases productivity. It can be used up to two-storey height without any lateral supports. For greater heights, any number of additional storeys can be made with additional lateral supports at each storey height from the building under construction.

Indian Pat. No. 115207

Dual flushing cistern

P. B. Rao & Ishwar Singh
CBRI, Roorkee

Syphonic type flushing cisterns available at present are capable of only full capacity discharges, whereas a fractional capacity flush for a minor use of water closet pan, such as for urination, is quite sufficient, and thus reduces water consumption without lowering the hygienic and amenity standards. The operation is quite simple and is achieved by a pull of chain as in the conventional type. The arrangement for a dual flushing system may be provided at the time of manufacture. The existing syphonic type flushing cisterns can also be converted into dual flushing type with a little extra cost.

Indian Pat. No. 117404

Manual scaffold hoist

B. C. Srivastava & R. L. Gupta
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Manual scaffold hoist provides a safe and sure means of haulage. The assembly weighs 100 kg and can be split into four sub-assemblies each weighing not more than 30 kg for easy mounting at the required level. The hoist can lift weights up to 300 kg to a height of 20 m. The lifting of materials is controlled with the help of a lifting handle and safety is ensured with the use of ratchet. Maintenance of hoist is simple. The hoist quickens the lifting operation at a lesser cost, especially where power is not available. The fabrication of the hoist does not involve skilled labour and any small firm can manufacture it. The fabrication cost is etimated at Rs 800 which can be brought down by mass production.

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